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## An Atlas of Academic Practice in Digital Times

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# An Atlas of Academic Practice in Digital Times

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## Abstract

*In the current literature on the university it is generally accepted that processes of digitization play an important role regarding both the daily functioning of the university as an institution and the academics that give shape to it. This article contributes to our understanding of the role that digitization plays in contemporary academic practices and does this by adopting a relational theoretical framework informed by sociomaterial studies. Furthermore, the article introduces a specific interview technique as methodological approach and makes use of topological visualizations in order to qualitatively analyze the composition of academic work in digital times. As such, combining textual and visual analysis, the article should be conceived as an explorative atlas. The atlas gives an account of how daily academic practices are relationally composed, by focusing on the spatiotemporal constellations enacted in these practices, and on how the digital acts and operates in these practices. Based on three profiles of academic practices, this atlas concludes by exploring whether contemporary academic practices are characterized by a typical mode of existence, and gives some pointers as to how this mode of existence of the university is typically enacted nowadays.*

Keywords: educational research, universities, topology, sociomaterial studies, digitization, academics

## Introduction

In the current literature on the university it is generally accepted that processes of digitization have had, and continue to have, a profound influence on both the daily functioning of the university as an institution and on the academics that inhabit and give shape to it. Over the last two decades, for instance, it has often been argued that some kind of “digital” university is coming to the fore, a university that looks profoundly different from the university-as-we-knew-it. This traditional university is then conceived as an institution, hardly changed since its inception in the Middle Ages, where a congregation of professors and students gathered physically in order to pursue some kind of Truth (in the broadest sense of

the word) (Illich, 1991; Newman, 1999; Masschelein & Simons, 2011). Characteristics of the ‘new’, digital university on the contrary would include a different external and internal organization comprising, among other things, an open character, a flexible networked and non-hierarchical culture, an increasing globalization of research and knowledge, etc. (De Wit, 2007; McCluskey & Winter, 2012). All in all, however, it has been argued that a lot of hyperbole surrounds current discussions about the role or impact of ‘the digital’ on universities worldwide (Ruppert, Law, & Savage, 2013; Woolgar, 2002).

Contemporary empirical research on the current condition of the university can be roughly divided into two main categories. On the one hand, much research adopts a *personal approach*, frequently directed at the *self-understanding* of academics, that is, at how academics themselves perceive certain aspects of their jobs. This personal approach has made clear that the professional life of these academics is increasingly rooted in digital technologies, and that this is changing the very nature of the work they are doing. As such, the personal approach results in studies providing detailed analyses of the sense-making of academics with respect to ‘digital’ aspects of their profession and how these academics deal with such aspects of their daily professional life (e.g. Kuntz, 2012; Tuchman, 2009; Ylijoki, 2013). A second approach, on the other hand, could be termed as *contextual*. This approach focuses on how broad technological and societal evolutions *impact* the university in particular today, and as such tries to grasp how digitization, as a contextual-societal input factor, influences the very nature of what it is to be an academic or a university today, as some sort of resulting output (McCluskey & Winter, 2012; Peters & Bulut, 2011). In this regard, this second research strand closely resembles other contextual studies that seek to clarify how particular societal processes (e.g. globalization, marketization) impact on the university today (Nelson & Wei, 2012; Readings, 1996).

This article adopts a third, sociomaterial, approach to this matter. Whereas the aforementioned approaches tend to focus either on the person of the academic herself or on the university as an institution, in this article we are focusing on academic *practices*, constituted by both human and non-human actors, and how the digital acts and operates in these practices. That is to say: this third approach focuses on the *composition* of academic work in general (e.g. Hamon & Rotman, 1981; Latour, 1989; Latour & Woolgar, 1986) and on the agency of the digital in this composition in particular. By doing so, this article will investigate academic practices in the making by disentangling the (relations between) human and non-human *actors* constitutive of the formation of a particular practice (Fenwick & Edwards, 2010; Latour, 2005, 2010). The central *empirical* focus of the article is directed toward the role of the digital in this composition: how does the digital play a part in shaping daily academic practice? In order to answer this general research question, this article argues that specific and innovative methodological and analytical tools are needed in order to scrutinize this composition. Using visualizations not as mere illustrations but as integral to the investigation, is an analytical technique whose importance has only recently been recognized, and which has been used very scarcely in sociomaterial studies until now (Latour, Jensen, Venturini, Grauwin, & Boullier, 2012; Marres, 2012). We will first describe this methodological vantage point, which is based on *topological visualizations* of networks of academic practice. After that, we present the visual and written results in the form of a (topological) *atlas* in order to end with a coda in which we elaborate on our findings and connect them to some points outlined in this introduction.

## Modes of Inquiry

### *Data Collection*

In order to analyze the composition of academic practices, a methodological design was devised that would enable us to meticulously follow the different actors populating these practices. To that end, we interviewed six purposefully sampled professors (different countries, universities, fields of research) about their previous working day, that is, from the moment of waking up till the moment of going to sleep as we did not want to make presumptions about what constituted work time and an ‘academic activity’ and what not. Specifically, in order to focus on these actors and interactions, and slightly inspired by the interview to the double (where respondents are asked what a double of them would have to do in order to function normally during the course of a working day – Nicolini, 2009), each interview was set up as a kind of *hearing*, where we asked each respondent to report on every detail of what s/he did the previous day. The role of the interviewer was to pose questions that would retrieve as many details as possible about the actors (colleagues, students, paper, personal computer, ...), and the interactions between these actors (using, typing, talking, ...). In that respect, the contents, feelings or meaning-giving of the respondent were of no primary concern. Rather, the interviews were designed so as to make each respondent an observer of her own activities during the previous day. Hence, the focus was on what might be called the *direct sphere of interaction*, that is, with which human and non-human actors a respondent interacted. After transcribing each interview (duration: 1.5–2 hours) verbatim, the transcripts were considered as *observer notes* that presented six accounts of academic practice, focused on the actors and interactions that assembled on these six days (Decuyper & Simons, 2014).

### *Data Visualization*

The visualization process started with the study of each interview transcript to identify different actors of all kinds. Since sociomaterial analyses try to keep the level of analysis as flat as possible (Latour, 2005), we refrained from introducing ‘aggregated’ actors – especially in the case of computerized actors. That is to say, if a respondent mentioned that she used a computer for a particular activity, we did not use ‘computer’ to be at the level of an actor, but rather the specific *software program* (e.g. word processor) or *software function* (e.g. the search function of a particular program) that was used at that particular moment. Simultaneously, we listed all interactions, that is, actions that took place between – inter – different actors, e.g. between an academic using a software program, between two synchronizing software programs, between two people discussing a certain matter, etc. Second, we visualized the resulting constellations of actors and interactions through the graph visualization program *Gephi* ([www.gephi.org](http://www.gephi.org); Bastian, Heymann, & Jacomy, 2009). Each graph consists of nodes (‘dots’) that visualize actors and edges (‘lines’) that visualize interactions between actors.

The overall form of each network was then obtained by deploying a *force-based* algorithm called ForceAtlas (Jacomy, 2011). Force-based algorithms model the overall shape of a graph in such a way that they render the connectivity of actors visually intelligible: linked nodes attract each other, whereas non-linked nodes are given a repulsive force. Consequently, the relative position of a node *vis-à-vis* another node is dependent on the

connections of this node with other nodes (Severo & Venturini, *in press*, p. 8; cf. Decuyper & Simons, 2014, p. 95):

Once the algorithm is launched it changes the disposition of nodes until reaching the equilibrium that guarantees the best balance of forces. Such equilibrium guarantees that if two nodes are close [...], they are connected directly or indirectly (connected to the same set of nodes). In other words, the fact that a node is positioned at the top, bottom, right or left margin of the images is fortuitous, but the fact that it is positioned toward the margin (and not toward the centre) and the fact that it is positioned close to some nodes (and not others) is meaningful. Running the same spatialization algorithm several times, the images could be rotated or flipped, but the relative position of the nodes would not change (close nodes will always be close, far nodes will always be far).

The ForceAtlas algorithm thus spatializes a network of nodes and edges based on an attraction of connected nodes and a repulsion of non-connected nodes, eventually leading to different *regions* in a graph. At the moment of writing this article, for instance, not only are there two authors involved, but equally a screen, a word processor, a printer, and so on, all of them interacting with each other: the authors reading the screen, the word processor inciting the printer, the printer instructed by the authors, etc. Because all of these actors interact with each other, the force-based algorithm would visualize this distribution in a region of interconnected nodes positioned close to each other. In what follows, attention will be given to academic practices in terms of regions of actors and interactions. These visualized regions are, then, neither derived from the intentions or sense-making of academics, nor from the content and meaning of their interactions, but rather from the intensity of these interactions. In other words, instead of looking at academic practice as an a priori set of ‘domains of actions’ (e.g. teaching, service, research), Gephi visualizations allow us to scrutinize the composition of academic practices by distinguishing regions of actors, based on the intensity of their interactions.

Third, once all the nodes and edges had been entered into the database, we focused on different aspects of each visualization. This was done by manipulating different parameters: different sizes of nodes (more interactions leading to a bigger node); different colors of nodes according to the type of actor (digital or analog for instance, see Table 1); different emerging regions (stressed by highlighting/encircling them – see Latour et al., 2012). The last option was effectuated by means of the vector graphics program *Inkscape* ([www.inkscape.org](http://www.inkscape.org)).

Overall, this process of data visualization resulted in six different maps of academic practice (one per respondent), each map having its own distinct characteristics. We analyzed these six maps separately and collectively according to five topological dimensions.

### *Data Analysis*

In the (sociomaterial) interest of analyzing academic practices from the starting point of the actors and interactions in these practices, this composition is presented in the form of *topological* visualizations. It is important to stress that topological visualizations of academic

**Table 1:** Five topological dimensions of the visual analysis

	What	How to read	Dimensions
Regions	(Visual) areas in the distribution of academic practice, consisting of a concentration of actors and interactions	Regions consist of actors that interacted more with each other than with others on that particular day. As such, they allow for a spatial understanding of activities that took place (but not necessarily chronologically).	<i>Demarcated:</i> Maps are demarcated when they consist of regions that barely overlap. <i>Concatenating:</i> Maps are concatenating when they consist of many overlapping regions.
Centers	Relatively highly connecting actors within a particular region	Centers are always located within a particular region, since they connect with/to many other actors. As such, centers are always centering.	<i>Centers:</i> Actors with many connections, positioned in star-like formation. <i>Peripherals:</i> Non-centers.
Density	Interconnectedness of actors in a region	The density of a (part of) a map tells something about how ‘busy’ a particular aspect of academic practice is. A high density implies that many actors are mobilized in order to (per-)form a particular activity.	<i>Low density:</i> A region or map has a low density when there are not many connections between actors. <i>High density:</i> A region or map is dense when there are a lot of connections between actors.
Interfaces	Parts of academic practice where the boundary between two or more regions is permeable	The permeability of a region points to parts in a network where one or several actors are being deployed in more than one activity in order to conduct particular activities.	<i>Boundary actors:</i> Actors positioned at the border of two or more regions. <i>Boundary zones:</i> A group of actors positioned at the border of two or more regions.
Infrastructure	These partitions of kinds of actors that populate a particular map	The infrastructure of a map contains several types of actors (but in varying degrees) and as such tells something about the kinds of actors that connect the overall map throughout.	<i>Digital:</i> All digital actors, colored red. Examples: tree structure of email program, web browser, chat program. <i>Analog:</i> Non-human actors that are not digital, colored yellow. Examples: paper, pen, coffee. <i>Digital-analog:</i> Non-humans that are both digital and analog, colored orange. Examples: printer, computer screen. <i>Human:</i> Human actors, colored green. Examples: colleagues, students. <i>Generic:</i> Neither digital, nor analog actors that are of a more generic kind, colored gray. Examples: research project, art history.

practice need to be interpreted in a specific way, that is, they require a specific way of reading and looking. Instead of looking at what happens when, and for what reason (focusing on chronology, intentions and explanations), the focus is on who and what plays a role, and the relations involved in this who and what (focusing on topology, distribution and rich descriptions). In order to focus on this who, what and how, the composition of academic practice will be visually analyzed along five dimensions, characterizing the particular *form* of an academic practice as spatialized by the ForceAtlas algorithm: regions, centers, density, interfaces and infrastructure. These dimensions draw on sociomaterial literature giving topological accounts of the concrete composition of different practices (Bowker & Star, 1999; Decuyper & Simons, 2014; Latour et al., 2012; Law, 2002; Martin & Secor, 2014; Mezzadra & Neilson, 2012; Venturini, n.d.):

Based on the visual analysis of each map along these dimensions, we were able to discern three different profiles of academic practice. Each profile consists of a number of *homeomorphic* maps: that is, even though the different maps of academic practice in one profile are (obviously) not the same, they nevertheless take up a similar *form* when analyzed along these five dimensions (Law, 2002). Furthermore, the *implications* of the three profiles of academic practice (including their respective homeomorphic compositions) will be analyzed. That is to say: compositions are never neutral, but on the contrary always enact particular relational effects. Of course, several effects could be studied, but we will limit ourselves here to those effects that are often mentioned in (topological) literature, namely effects on the actors in these compositions and the inauguration of highly specific spatiotemporal constellations (Barnett, 2011; Law, 2002; Thompson & Cook, 2014). Therefore, in addition to each profile an account will be given of the particular implications of each profile on the sort of actors, space and time enacted. Furthermore, and where illustrative, quotations of the interviews were used as complements to the analysis. All this (the collection of topological visualizations in the form of maps, rich descriptions and implications) constitutes an *atlas* (of the composition) of academic practice.

Furthermore, in the process of data analysis, we adhered to the interview transcripts/observer notes without making any additional explanatory or contextual additions to them. That is to say, we took these notes to be a unique *infralanguage* of the respondents (Latour, 2005). Additionally, in the accounts composed we will use what could be called quasi-concepts: *concepts* because they try to offer an account of what happens in a particular situation, *quasi-concepts* because these concepts do not jump towards the level of providing explanatory generalizations and do not radically impose some kind of metalanguage on the language used within the described practices themselves. Precisely because they seek to give an account of topological distributions, such quasi-conceptual terms are often diverse and tuned to the composition at hand (see Decuyper & Simons, 2014).

## An Atlas of Academic Practice

All figures in this atlas display visualizations of academic practice according to the design principles outlined earlier: each figure illustrates a (part of a) topological map of academic practice during the course of one day. The overall distribution of each map is highly different: we can see heavily populated and smaller ones; maps with low and high density; maps with many regions and maps with fewer regions, etc. In what follows, we give a rendering of



## Profile I

First, as can be seen in [Figures 1 and 2](#), each of the two maps of this first profile displays well-demarcated *regions* that are positioned relatively separately. In Julian’s case, an example would be the red one in which we can see a doctoral candidate, a PhD dissertation, members of a doctoral jury, etc. In this region, the actors present and the connections they established led to an activity in which a promovenda and her dissertation were being judged with respect to whether this dissertation was a valuable piece of academic work. That this red region itself is clearly demarcated implies that this activity of judging did not mobilize actors from other regions (except for the actor ‘paper’ – but see later), or to rephrase this point: it implies that this activity of judging was effectuated by means of regionally-specific actors, that is, actors deployed in only one specific region. This equally applies for Eugene’s map, of which one region is displayed in [Figure 3](#). This yellow region shows a conglomerate of actors that point to activities of retrieving information (by means of two different browsers and two different websites) and of storing that information (by means of a note-taking and archiving piece of software). Demarcated academic practices, then, point to conglomerates of regions in which very specific actors with a clear-cut ‘function’ are deployed in order for activities to be able to occur: the browser retrieves information (and does not do anything other than this in the course of a whole working day), the note-taking app stores information (and does not do anything other than this in the course of that working day).

The network graph visualization shows a central node labeled "Julian" connected to numerous other nodes. The nodes are color-coded into clusters: blue (top-left), yellow (top-right), green (bottom-right), red (bottom), and purple (right). The blue cluster includes nodes like "Map Outlook", "Screen", "Delete folder", "Delete button", "Newsletter (electronic journal)", "Wireless internet", "MS Outlook (Hotmail)", "Wall function (mathematical)", "E-mails IN", "Mobile phone function (delete folder)", "Delete built-in smartphone", "Short message", "E-mails OUT", "Regior", "Mapping", "Project", "Strategy", "Project operator", "Conservator", "City Museum", "Calling function smartphone", "Lecturer", "Poster", "Overhead", "Lecturer", "Colleagues", "Audience", "Quote of the day", "Promo agenda", "Other members of the presentation", "Questions", "Paper", "Examine", "Comments", "Disputation (chapter)", "Green", "PhD student", "Financing", "Vacancy", "University history", "Colleagues (other faculty)", "Candidate 2", "Colleagues (same faculty)", "Reader 2", "Candidate 1", "Shower", "Pocket", "Beer", "Vibration function smartphone", "Text message IN", "Text message function (smartphone)", "Alarm clock", "Car", "Sunby function smartphone", "Breakfast", "Beer", "Colleagues (Replacer)", "Julian", "Other faculty", "Educational assistant", "Organisation of educational program", "Educational courses".

### Figure 1



activities related to the preparation of several meetings. Actors in these regions are (relatively) placed on their own. Being placed on their own, it can be argued that these actors do not mobilize many other actors but are rather self-contained. A file hosting service, for

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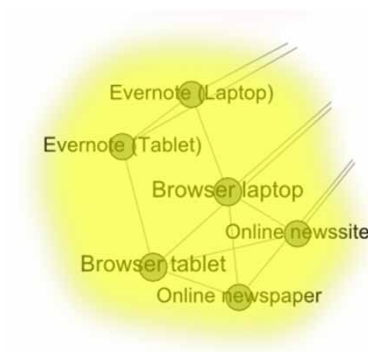


Figure 3



Figure 4

instance, enables different documents to travel from one place to another (that is, affording mobility), without affecting them (that is, remaining immutable), and hence gives shape to academic practice without having to mobilize many other actors. This differs in the two blue clusters that visualize communication (email) activities: both the number of actors and the regional connections between them are manifestly higher. Indeed, these regions are the only two in this profile in which the density is relatively high. It is then not surprising that, third, two highly influential *centers* appear in these blue clusters: the email inbox and outbox. Another center is found in Julian's map (paper). Being a center is not only a matter of connectivity: many actors connect with, for example, the inbox, and so by being an important passage point for many actors (maps, emails, organizations, persons), the inbox obtains a powerful status, a status by means of which it gains *authority*. If an actor obtains/is granted the role of a center, then, this signifies that many other actors depend on this actor and hence that it is *being rendered* authoritative, precisely because other actors make it important (Figure 2).

Fourth, since the two maps in this profile are characterized by a demarcated distribution, the permeability between different regions is rather low and hence there are few *interfaces* apparent in each academic practice. There are, however, a few actors that do constitute an interface in between regions and hence enable a switching between activities. The actor ‘paper’ was just mentioned as an example of such a *boundary actor*, connecting three different regions and hence standing relatively on its own. By deploying an active role in three regions, the actor ‘paper’ allowed for each of the activities pertaining to these regions to be enacted in that particular manner, and hence also enabled Julian to switch between these three adjacent regions of academic activity. The other boundary actors present in this profile are a word processor that could be conceptualized as a form of ‘digital paper’ (Eugene), a research project (Julian), and a student (Eugene).

Fifth, as to the type of actors present, it is apparent that the *infrastructure* of the map largely coincides with the regions that have been outlined: Figures 5a and 5b show different types of actors spread over the map in a regionally-concentrated way. Despite the observation that Eugene’s practice largely consists of digital actors (red), while Julian’s map contains more human and analog actors (green and yellow), in both maps different regions coincide with different types of actors. For instance, whereas communicating is effectuated primarily digitally, judging and evaluating primarily take place by means of analog and/or human actors.

#### ‘Implications’

What do these homeomorphic renderings tell us? Just as in a traditional atlas, in which the form and ecology of a particular area of land, ocean, etc. tell us something about the implications of this for the population, the prevalent wildlife, the vegetation, and so on,

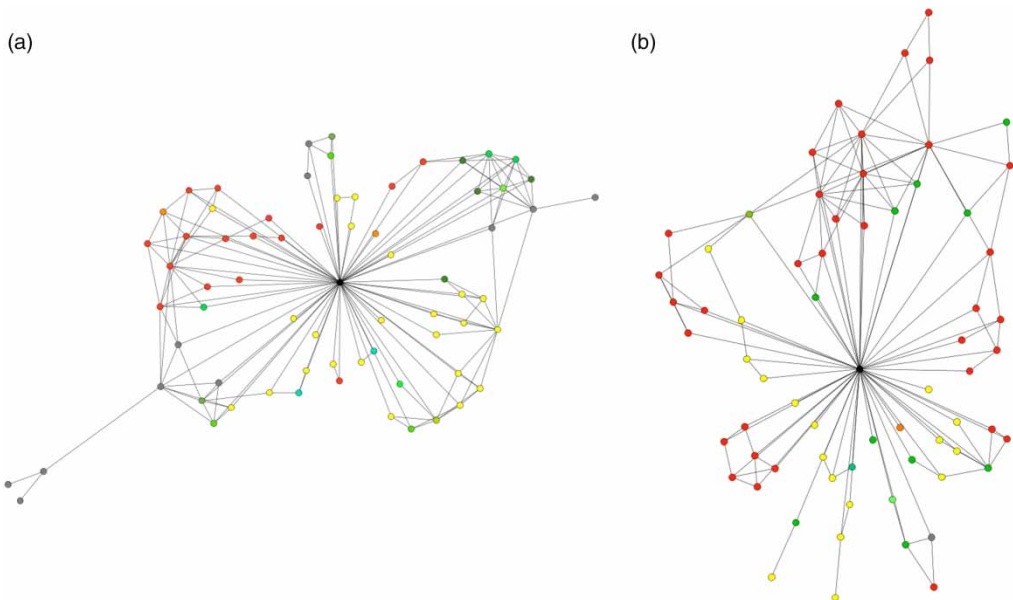


Figure 5

the particular topology of each profile has implications for academic practice, namely what sort of *time* and *space* are created, and what sort of *actors* populate each profile. In a demarcated academic practice, many activities happen relatively separately/successively. Eugene, for instance, remarked with respect to successive activities that:

You have to [be] able to keep concentrating on the core task you are busy with. Otherwise, you get what so many people complain about: that they don't arrive at doing anything because of email. (...) I deal selectively with email. If there is an email of which I think: 'This is important', But that doesn't need to be answered right away (...), I put it in another folder called 'to do'. And I deal with these each day at least half an hour, often outside regular hours, at evening after dinner.

As Julian remarked, this succession of one more or less self-contained activity after the other gave rise to what he called a *shredded whole*:

It has something ... It has something, yes, obnoxious, having the idea: 'I didn't do so much today', whilst you have been running around like a fool from 5 a.m. to 11 p.m., thus, I mean, these are long days ... And that is the type of day that occurs even in less busy periods. It really is some sort of shredded whole.

In other words, this profile is characterized by a *managing of the present* in such a way that academic practice is 'shredded' (what we have called demarcated) and made manageable by doing one thing after the other, such as for instance (only) the envisioned 'core task' (and not combining that with processing incoming emails). At the same time, this managing of the present gives rise to what can be called *prefiguration*: by designing the day as some sort of to do list, future events are rendered present in such a way that one knows almost exactly what to do, at what time. Thus emerges a timescape in which academic practice is characterizable as a fragmentation of one activity after the other.

The demarcated academic practices of this first profile not only enact a fragmenting timescape, they also enact a sort of *mosaic space*, differentiated into functional spatial settings: having a meeting in one's office is done at one particular desk, whereas browsing the web or using other digital actors is effectuated at another desk (Eugene); having discussions with project collaborators or colleagues is always done in their office and not in one's own (Julian); work is principally all done at the university and never at home (Julian), etc. Consequently, and perhaps because of the observation that some activities are to be performed without digital actors of some kind, this mosaic space requires mobility on the part of the academic, who has to displace himself constantly from one setting to the other. This can also be derived indirectly from the visualized distribution of actors in the two different practices that belong to this profile: since most actors are regionally-specific, they pertain to one unique academic activity and are not deployed for different uses. Exceptions in this respect are the boundary actors mentioned, which have an enormous importance: they are (undetermined and associating) *relays* through which some flexibility emerges and that have no region-specific place of their own (e.g. paper, a research project, a word processor). Even though these boundary actors are not the most prevalent, they have a decisive role in the conduct of academic practice and are perhaps, as we will argue later on, typically *academic* actors.

## Profile II

### Form

At first glance (Figure 6) the form of the second profile is similar to that of the first: most *regions* do not show many overlapping (boundary) actors but, rather, visualize demarcated academic activities. In total, six regions appear on this map. The two brown regions designate activities that took place in the private sphere. In the smaller brown cluster, the activity of waking up is displayed. In the bigger cluster, typical family activities are displayed: talking with other members of the family, watching television, helping with homework, etc. In the gray region, a common activity, also found in the profiles of Eugene and Julian, is displayed, an activity of *preparing* something (in this case, educational courses). In the green region, a communicating activity is displayed in which Sandra communicated with, among others, her ex-promoters, by means of different smartphone functions. Additionally, Figure 7a (blue) displays the recurring communicating region, which takes shape around the two centers of incoming and outgoing email traffic. Like the academic in the middle (i.e. Sandra), these two *centers* gather many heterogeneous actors around them: colleagues, students, hardware (keyboard and mouse buttons), different folders, sheets of paper, identifying numbers, etc. Figure 7a visualizes the distribution of these actors. All of these, even a seemingly banal actor like ‘email headings’, for instance, take up an active role:

Oh yes, I answered some emails. ( ... ) But there equally are many mails of these newsgroups I have a subscription to. And I don't think that is nonsense, but you have to do that only if you have time. ( ... ) Most of the time, however, it is click, shift, click, delete. So I select the whole gamut, and then it goes away. And only the mails I have to do something with, on these I answer.

Yes. And do you open these [newsgroup] mails? ( ... )

No, I am not going to get started with that. ( ... ) Just, “Whoosh, away”. No, I just delete those.

Another region in this map is the red one, displaying a ‘webinar’ activity. This webinar, streamed live to students, consisted of a question and answer session in which Sandra interviewed one of her colleagues. Figure 7b shows that this region is centered around some technicians, a colleague of Sandra and a software package. Other actors include a variety of technical (recording) equipment, but equally the aforementioned sheets of paper, an audience, etc. Together, they all made it possible that this webinar was conducted and streamed instantaneously to the computers of students who were watching Sandra and her colleague. In this region, we are thus dealing not only with centering non-humans, such as incoming and outgoing emails as in the communicating region, but also, and equally with personae taking up the form of a center, who gain authority by means of their connections with many different other actors. Because both people (Sandra, technicians) and things (recording equipment, sheets) made some connection with this colleague, for instance, this colleague was granted an authoritative position: this variety of actors making a connection with that colleague meant that she was an authoritative actor in the distribution of academic practice that day.



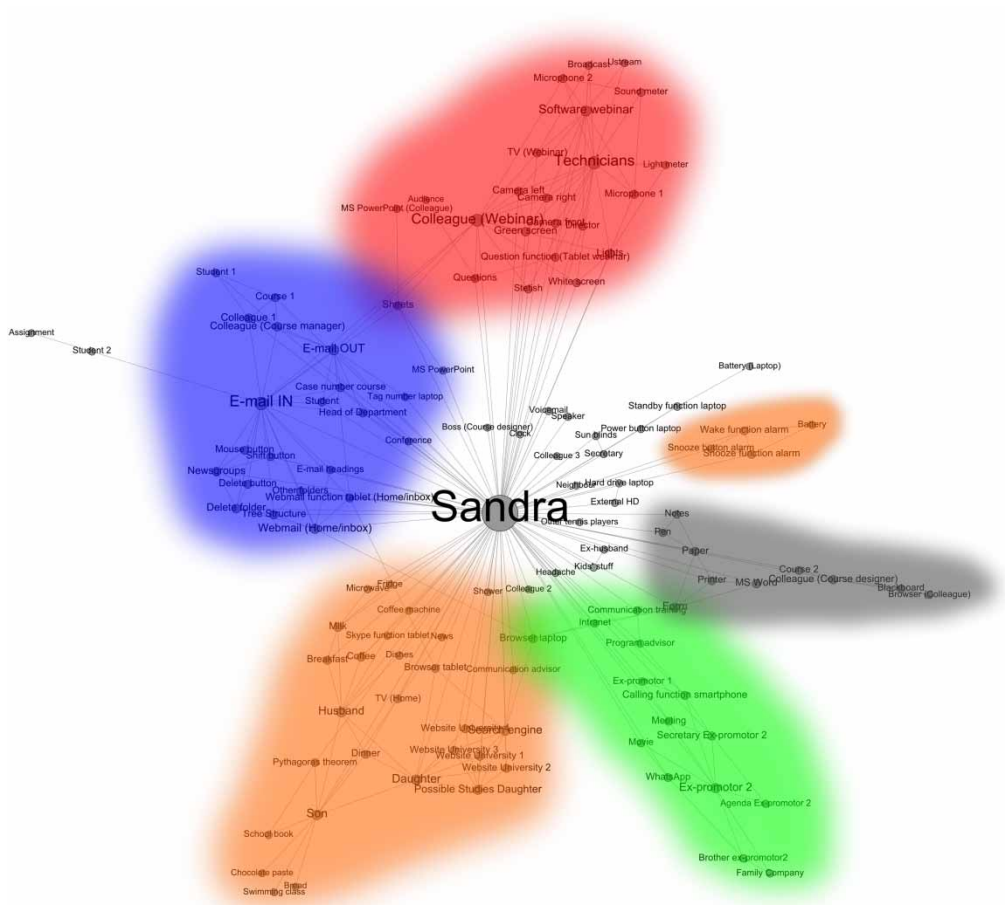


Figure 6

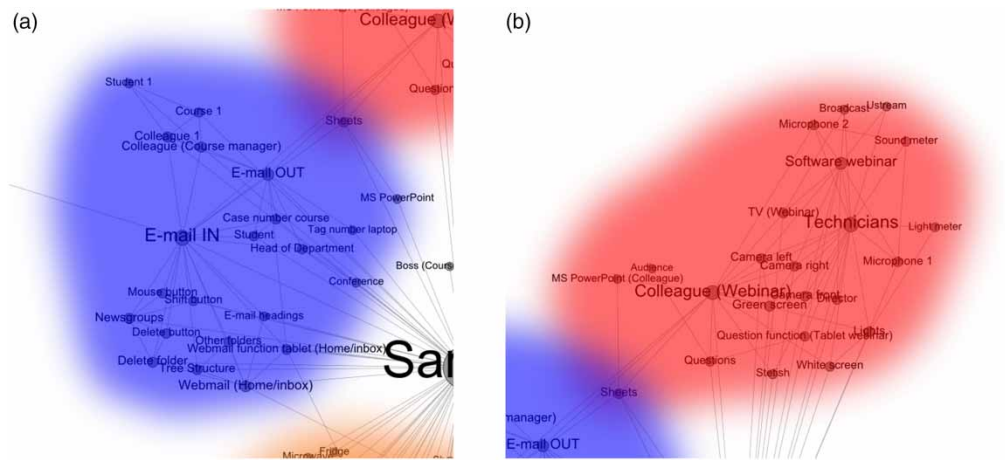


Figure 7

Correlated to the higher prevalence of centers, the *density* of this second profile is manifestly higher: since actors are granting a couple of other actors an authoritative position, a process of mobilization takes place in which the interactions between different actors are crucial. As we have just described, many actors mobilize particular other actors (e.g. an email inbox, a colleague) into the position of a center. This does not imply, however, that the relative importance of singular actors shrinks. On the contrary, it is only by means of the various connections of these singular actors that academic practice could be conducted in this manner: as the interview excerpt earlier shows, for instance, it is precisely these singular actors that are crucial in this process of mobilization as they enable some actors to emerge, eventually, as a center. In other words, a relational view situates authority not in the mere presence of an authoritative actor, but rather in the density of the relations between singular actors.

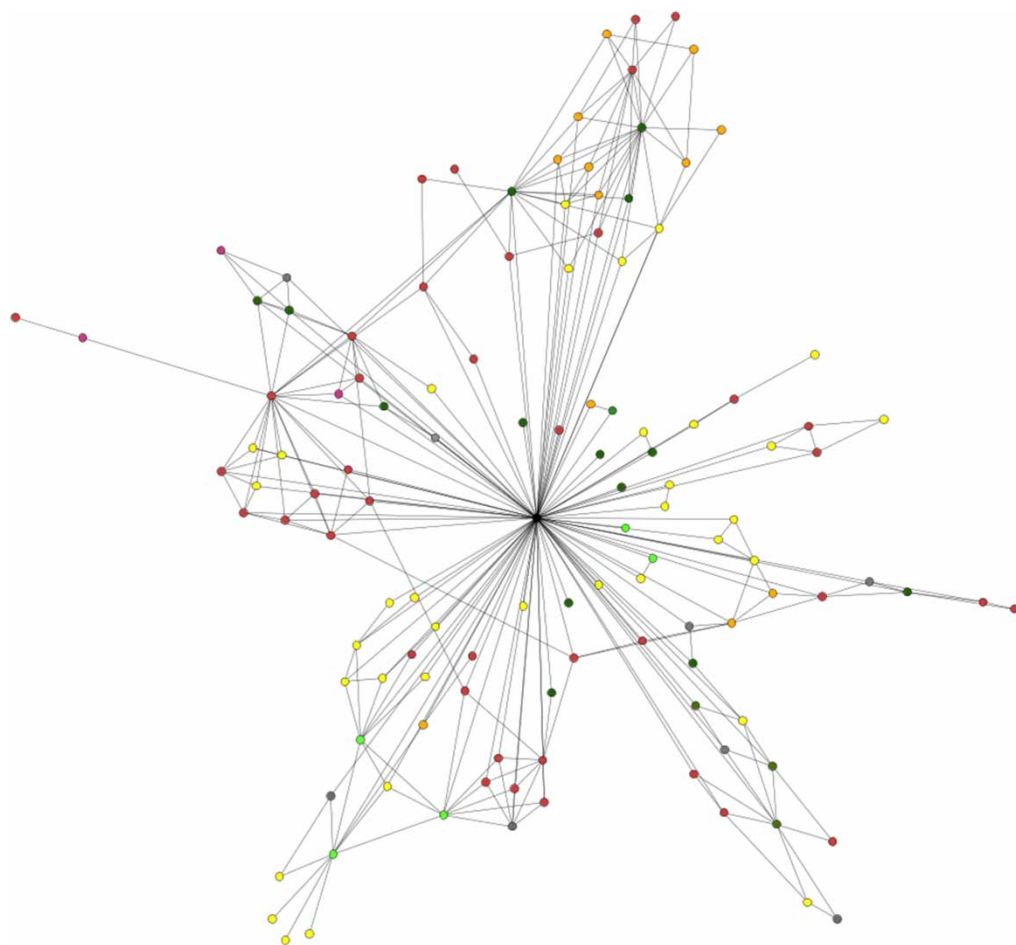
Furthermore, as to the *interfaces* of this second profile, three boundary actors populate this map: sheets (that were circulating in a communicating region and whose content was a matter of discussion in the webinar region), the browser of a laptop (deployed in both the green communicating region and in a brown private region) and a form (connecting a communicating region and a preparing region). Again, we can see that these actors have an important role in the distribution of academic practice, since they are positioned precisely on a boundary between regions and hence enable an effective switching between these regions. As such, they function as influential relays in between two regions. A 'browser', for instance, can be considered to be a proverbial clean slate that can be deployed in different activities: as a boundary actor, in the distribution of the map it is placed on its own and can, because of this position in between, be deployed in different distinctive activities.

Finally, [Figure 8](#) displays a very different *infrastructure* than the first profile. Whereas in that profile the type of actor largely coincided with the regions enacted, in this profile digital, analog and human actors do not so much coincide with particular regions but rather are scattered more or less everywhere. Hence, whereas the infrastructure of the first profile was relatively regionally specific, the infrastructure in this second profile has a non-regionally specific distribution.

### 'Implications'

As these descriptions illustrate, academic practice in this second profile resembles that of the first in some regards, yet is also quite different in others. This also holds for the 'implications' of this form. First, as to the temporal dimension, for instance, a prefigurative dimension, in which the (academic) future is being rendered present, can be seen again: courses are being prepared (gray). Equally, and analogous to the first profile, if one considers the upper half of the map, it can be argued that these regions give shape to a *fragmented* timescape in which one activity after another is being performed in order to complete due tasks (e.g. communicating, performing a webinar) (cf. first profile). The lower (brown and green) half of the map, however, seems to give way to a sort of *hybrid time* in which academic and private (social/family) activities merge and thus form a timescape in which it is hard to make a distinction between them because they tend to flow through each other, as well as being visually closely related:



**Figure 8**

Anyway ... We had dinner then, and afterwards we did the dishes. And then it was about 6.

Okay. Was your husband at home as well?

Yes. And then we watched the news (...), and then ... Yes, and then I checked my mail. At such times, I do that on the tablet, because that one is downstairs, and then I look for a moment. And sometimes, yes, students ask ... Yesterday as well, there was a message, about the case number of a course. Well, I just give that then. And then I reckon, 'Well, you can move on now as well', you know? So, these things intermingle very much ...

This excerpt, which reports part of the lower brown cluster and its connection with the blue communicating cluster by means of the web browser of the tablet, shows that family practices and academic practices tend to merge at some points in time. This equally applies for the green region, where professional–social relationships with two ex-promotors were maintained: whether these are an element of academic or social activities is hard to say.

Two digital actors play a crucial role in this respect and as such point to elements in the infrastructure that enable the conduct of both professional and social-family activities: the web browser of the tablet and the laptop.

Second, spatially conceived, the form of this profile gives rise to a *formatted* space: the blue communicating region (equally present in practically identical form in the two other profiles) clearly displays the formattedness of communication in the sense that one is communicating in a (an email) space in which one has to do this and this in order to be able to establish communicative acts. In other words, constellations of digital actors make things possible but also *stabilize/fix* the form of this activity into a format. The same applies for the red webinar region, which displays not only the role Sandra had to take up in order for this webinar region to be effectuated smoothly, but also the stabilizing function of constellations of digital and digital-analog actors:

Because a webinar implies doing four things at once, right? You keep track of time, you keep track of the questions you prepared, you have to listen to your interview partner. Uhm, that partner often has some slides on his laptop in front of him, slides he wishes to say something about ...

And all of this happens on one screen?

Well, even stronger, since in addition to that you also have a tablet besides you. There is someone who receives questions or comments from the public, a public that you do not see. And those you receive on your tablet. And yes, then you have three cameras (...) You have to do four things at once, but you just go on, you know, because you cannot but do it that way.

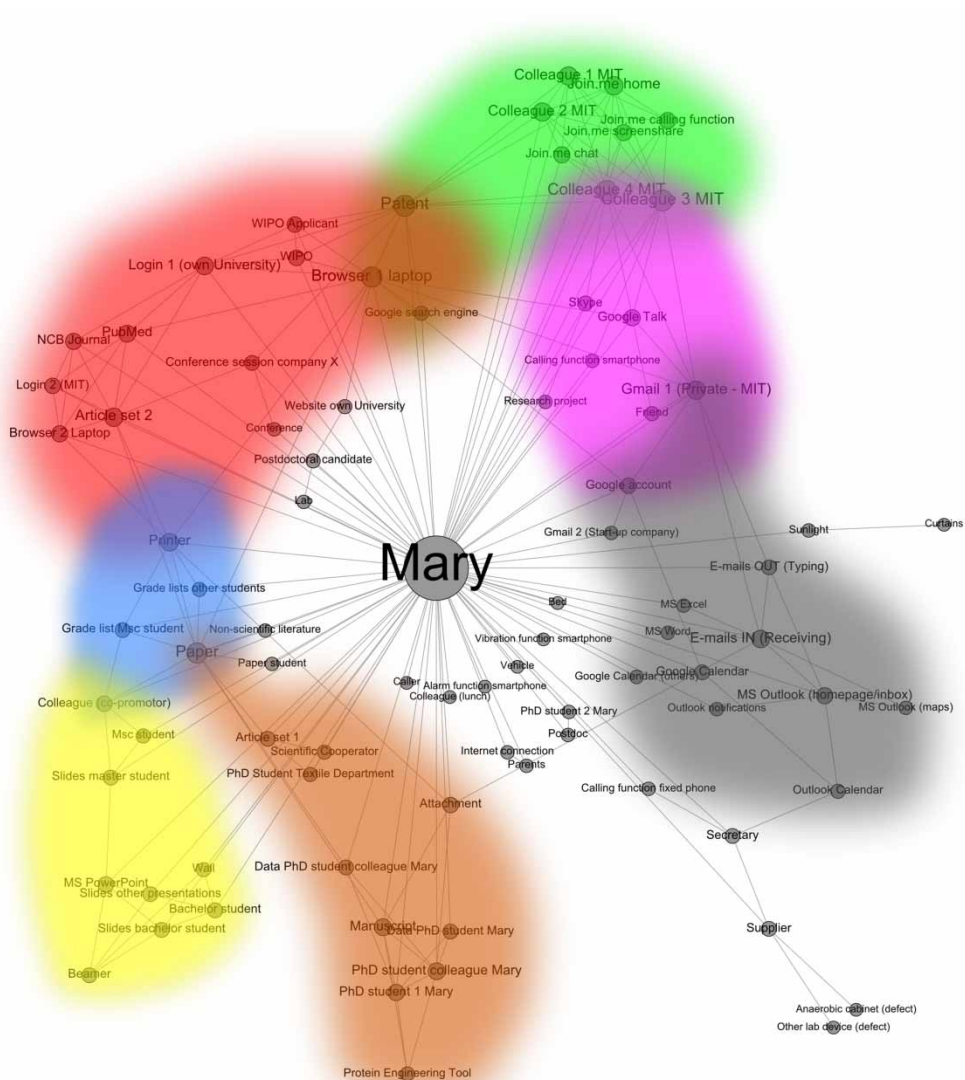
Because of the emergence of such a formatted space, academic activities were localized in highly specific places where such formatting took place: a recording studio in the case of the webinar, a communicating place in which one emails, etc. Again, we can see an academic practice that thrives on the mobility of the academic herself, who has to thread from one functionally differentiated space to another. As far as the hybrid time is concerned, however, it can be argued that such hybrid time is enacted in a well-demarcated and very specific place, that is, the place of one's own home. This physical place was transformed by digital actors (web browsers), in the sense that these actors enacted a digital space in which one could conduct, simultaneously, one's professional as well as one's family-social activities.

Third, in terms of the actors, this second profile clearly shows the importance not only of boundary actors (constituting a relay between adjacent regions), but also and equally of centering constellations of actors (e.g. software–colleague–technicians–camera), which both enable as well as fix the emergence of particular spatiotemporal constellations. Again, it could be hypothesized that such constellations point to typical academic spaces – but see conclusion.

### Profile III

#### *Form*

In this third profile of academic practice the form of the three different maps is quite different from those of the previous two profiles: overall, most *regions* marked in [Figures 9–11](#)

**Figure 9**

overlap with at least one other region on the map. In the case of Mary, for instance, all regions are positioned in a concatenation and thus connect with at least one other region. Patricia's practice displays a concatenation of four regions, in addition to a separate private region (yellow). The blue region, for instance, again displays already familiar activities of communication, in which emails are read and assigned to particular folders, and attachments received in the inbox are opened by means of text processing software. This software was used not only for opening and processing these texts, however, but also to display preparatory documents (that were also printed on paper) for a meeting in

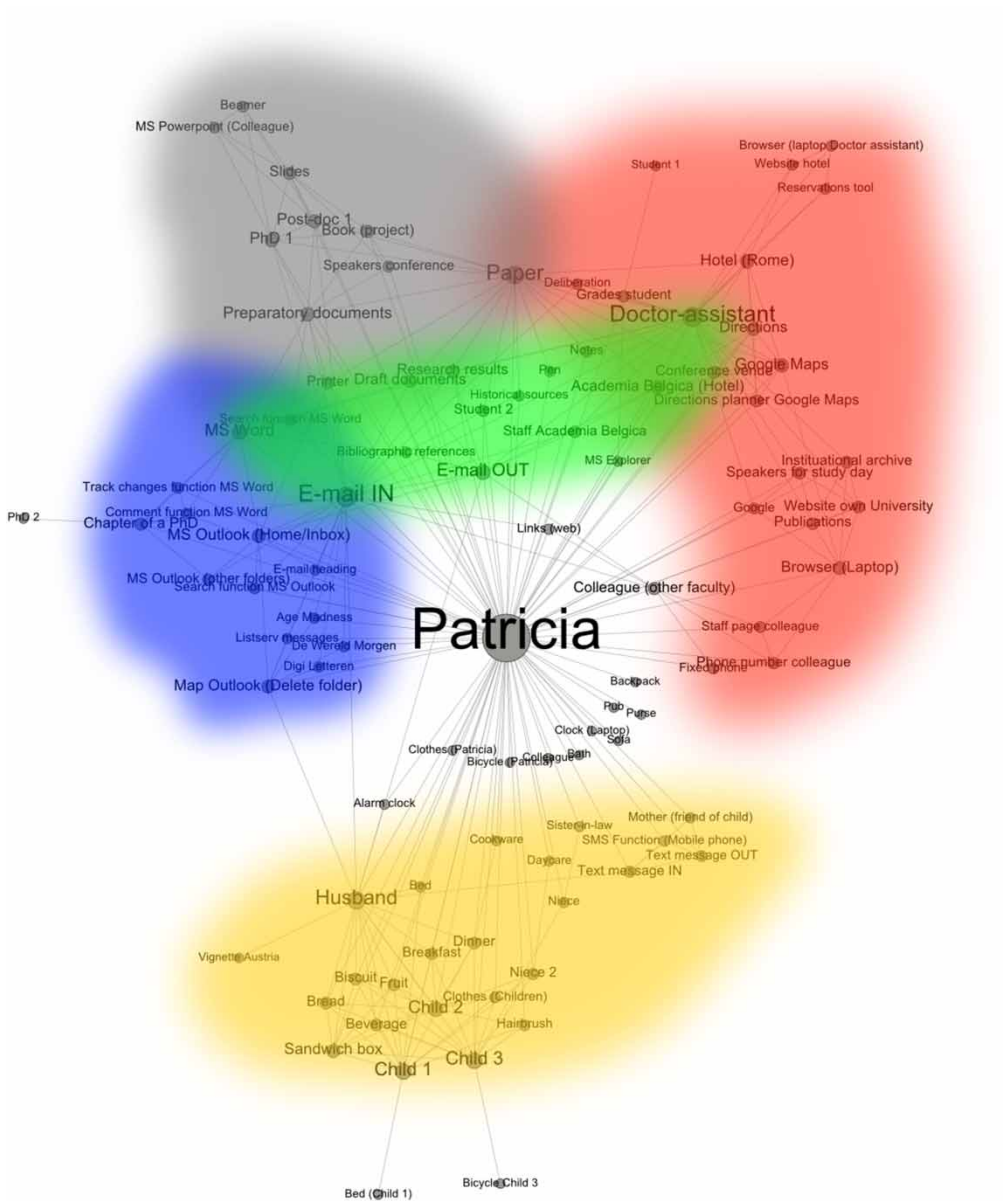
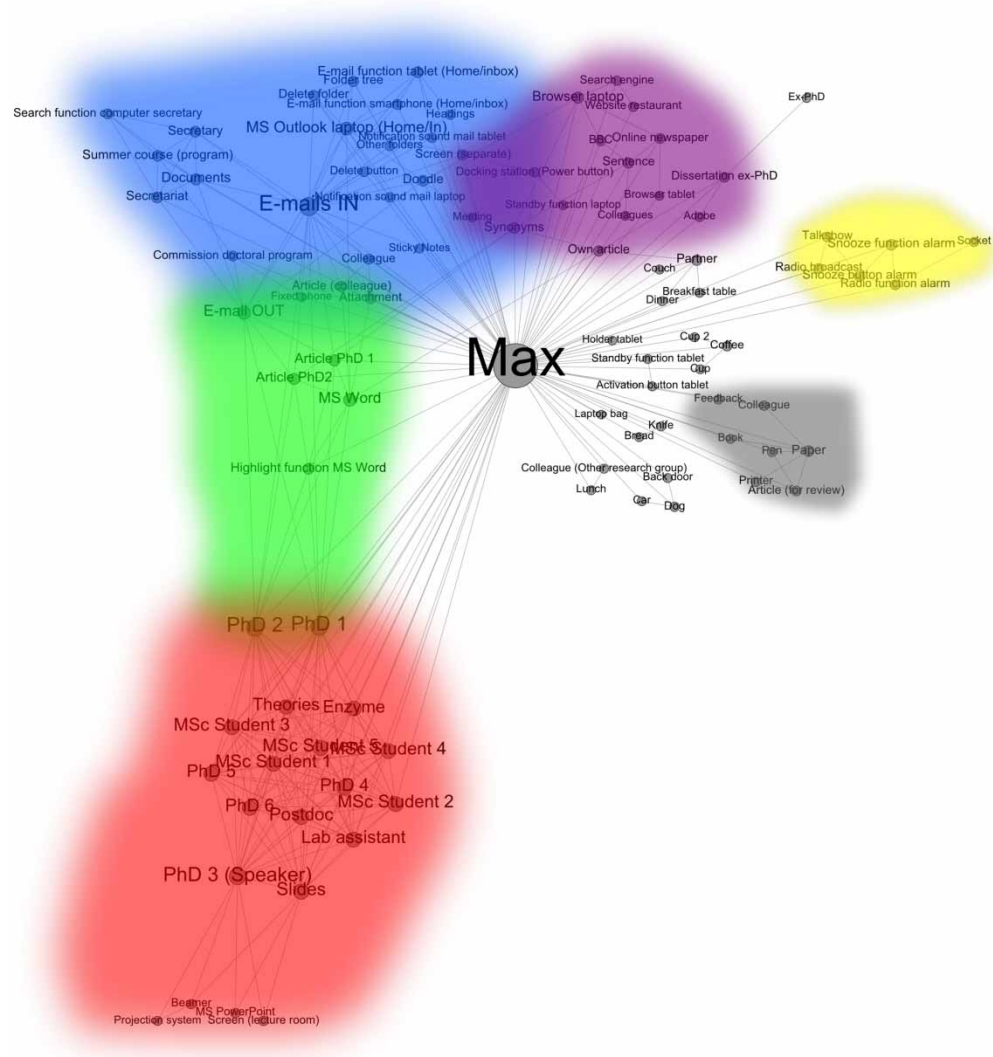


Figure 10

which Patricia, one of her PhD-students and a postdoctoral researcher tried to write an outline of a book (gray). In the red region, another meeting between Patricia and a doctor-assistant shows how hotel accommodation was sought for a conference and how a study day was being prepared.

In addition to this concatenating characteristic, the regions in this third profile can, overall, be characterized as relatively *dense*. A clear example in this respect is the red



**Figure 11**

region in Max’s map (Figure 12) that displays a seminar in which a PhD student gave a presentation about his research to other PhD students, MSc students, Max and some of his colleagues. Because of a discussion afterwards, in which many different parties talked with each other about that presentation, this region is very dense and positioned relatively separately. This is a consequence of the algorithm deployed, positioning connecting nodes relatively closer to each other than non-connecting nodes: since most of the actors present in this practice of seminar (and these are not only human actors, as we can equally see some projection materials and some research-related actors such as an enzyme and theories proposed in order to explain the behavior of this enzyme) interact with each other, they are placed relatively on their own. But even in this locally



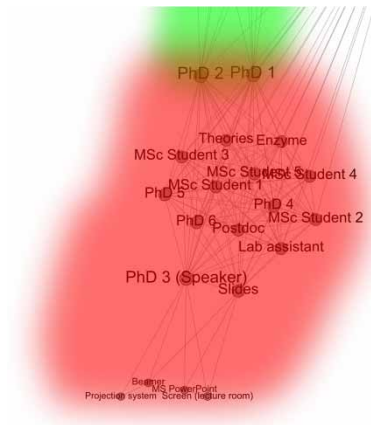
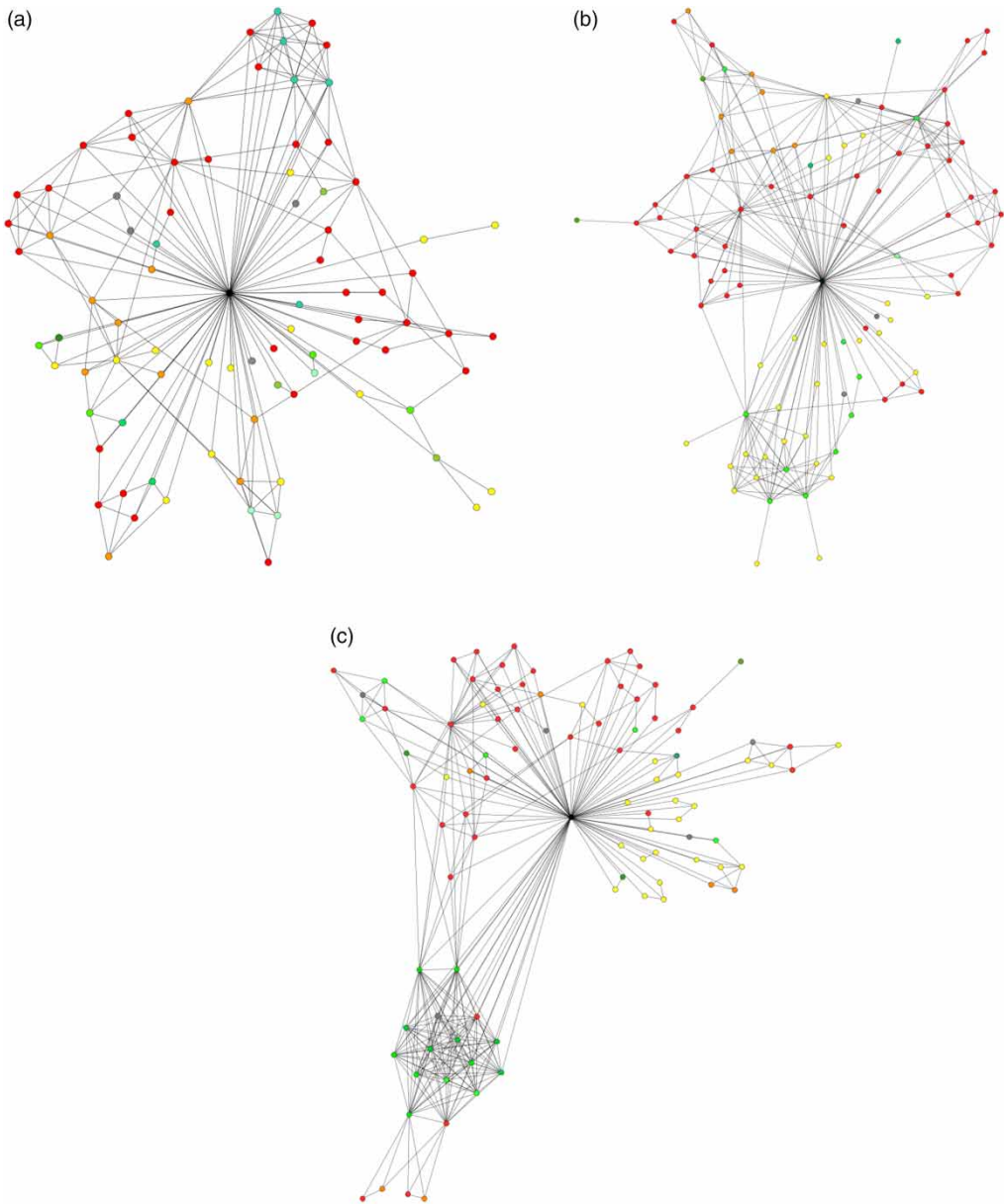


Figure 12

densely-connecting cluster, two actors (i.e. two PhD students) are positioned in such a way that they connect to another region of the map. In sum, this third profile is characterized by dense regions, where the activity/ies in that region coincide with activities in other regions, or (and this is the same point but slightly rephrased), where many different actors are deployed in different regions. This aspect of overlapping is distinctive compared to the two previous profiles, in which connections between regions were always situated at the level of relatively isolated boundary actors. Now, on the contrary, *interfaces* are established at the level of a *combination* of boundary actors. This makes it very difficult to say where one region starts and where another region ends, and hence makes the specificity of the actors taking part in a particular region hard to assign: to which specific activity did they contribute precisely? Since in this profile interfaces are constituted by multiple boundary actors, this is nearly impossible to say. Did the text processing software in Patricia's map contribute to communicating activities? Yes, but it also contributed to the preparation of a book. Did the patent in Mary's map contribute to a virtual meeting? Yes, but it equally contributed to an activity of retrieving information. Moreover, the software, or the patent, never contributed *solely* to these activities, but always in joint connection with other actors that were equally deployed in more than one region. As such, in this third profile, collections of singular actors are acting as regionally-independent relays. Examples are the combination 'Patent-Browser-Search engine' in Mary's map, or 'Email outbox-Article-Attachment-Fixed phone' in Max's map. Additionally, as far as the *centers* in this third profile are concerned, the position of these centers (e.g. a printer, colleagues, an assistant, a word processor, email inbox, synonyms, PhD students) is largely situated at permeable borders between different regions. As was argued in the case of paper in Julian's map, centers that can be equally characterized as boundary actors are especially authoritative: not only do they act as relays, enabling a relatively easy switching between two adjacent regions, but also they take up centering roles, since many proximal actors establish connections with them. In this sense, these centers have a decisive role in the conduct of academic practice on these particular days.



**Figure 13**

Finally, as far as the *infrastructure* of this third profile is concerned, [Figures 13a–c](#) display a scattered whole of digital, human and analog actors. As these renderings of the infrastructure of each network show, there is hardly any region to be found that contains exclusively one type of actor. On the contrary, each of these maps is an imbroglio of different types of actors that are positioned almost everywhere on the map, with a digital-analog actor often positioned in between digital and analog groups of actors.

*'Implications'*

This third profile displays the significance of combinations of region-independent *actors* establishing interfaces between regions. Similar to singular boundary actors, these multiple interfaces enable a switching from one to the other, i.e. from one region (e.g. communicating) to an adjacent region (e.g. retrieving of information). However, as multiple actors establish a permeable boundary in this profile, this makes for an academic practice that is constantly transmogrifying in the sense that performing one activity often simultaneously implies performing another activity:

And then ... I came to my office, and I saw that [the doctor-assistant] was luckily not here yet. That gave me a couple of minutes. And then I started eating my lunch. And ... yes, what did I do then? I know I didn't even start reading his document, since I already knew: 'It is hopeless, I will just wait until he's here'. (...) [The doctor-assistant] did pass by, but we started later, it was already after 2 p.m. In the meantime ... we talked through some practical issues. And I had to make a phone call at half past two. And then I gave him, you know, a little task to do inbetween. Well, a task, I was thinking: 'Oh, if you do this while I make the phone call'. (...) So at half past two I made the phone call, of which this is the residue (*points to a scribbled paper*) ... Uhm, yes, I regularly look up some things, on the internet, such as phone numbers of colleagues. (...) I did that yesterday ... when I had to call [a colleague].

*Temporally* conceived, academic practice in this profile is characterized by a *processing* time instead of consisting of harshly divided fragments (such as a to do list): a lot of different things (retrieving information, calling, ...) can occur in one delineated time-frame, even within a firmly demarcated timeslot such as, for instance, during a meeting. As such, the present is being enacted as an actual *opportunity*, and hence as a plastic present, where many things can be processed potentially simultaneously or can be refigured according to the situation at hand. In other words, it is the present here that is constantly *refigured*, instead of (only) the future that is being prefigured – and this by means of a scattered whole of human, digital and analog actors. Indeed, the infrastructure of this third profile seems to suggest that it is precisely this scattered combination of types of actors that generates a simultaneity where academic activities can be conducted *anytime* (exception: lower half of Patricia's map, which displays a part of the evening exclusively dedicated to the family). This equally applies to the notion of *space*. In this third profile, space is being rendered *plastic* to the point that academic activities can be enacted almost anywhere: in the parental home (Mary), in the bedroom (Patricia), in the kitchen or the bathroom (Max), etc. In this third profile, then, space is localized in a *delocalized* manner in which most activities can take place in any kind of space, because of the scattered infrastructure of the map that does not require the mobility of the academic herself. Rather, it is the mobilization of different other actors that allows the constitution of an academic practice potentially anytime and anyplace.



## Coda

This article started with the argument that much research dealing with the current condition of the university is focused on either the personal self-understanding of academics or on contextual societal evolutions and how these evolutions impact the university and its structures. This study, however, focused on the *composition* of academic work. The point of departure was that academic activities are enacted in practice (rather than predetermined beforehand) and a specific interest in how the digital might play a role in this composition. In doing so, an atlas giving an account of this very composition was proposed, to try to render something very domestic, that is, the daily work of most people who will read this article, unfamiliar (Bourdieu, 1988). The atlas, then, displays a variety of academic practices that were divided into three distinct profiles. Naturally, these profiles should be considered not as being attached to a unique person (as if the practices and the spatio-temporal constellations in which Eugene was involved would always belong to the first profile and the practices and constellations in which Sandra was involved always to the second), but rather as a rendering of the homeomorphism of different academic practices obtained by visual analysis and along five topological dimensions, that is to say: of *typical academic forms* (see also: Masschelein & Simons, 2010).

When one looks at, reads and leafs through a traditional atlas, it is only at the end that it is possible to draw conclusions about the geography one was reading about and that one was able to see only aspects of in different maps. Similarly, then, what is to be seen if we now consider this atlas in its entirety? If it does not consider universities to be separated systems with clearly demarcated functions (e.g. research, teaching, service) or as referring to a unique idea, how does it conceive of academic work in digital times? We conclude this article by arguing that if universities are analyzed *qua* daily practices, it becomes apparent that what is typical about academic practices is perhaps that they should not be considered on the basis of (collections of) internal actors or activities. Of course, actors bearing an almost natural ‘academic’ association with the university are to be found there (traditionally in the form of academic staff: PhD-students, colleagues, ...), but one can equally see actors in the form of museums the university is cooperating with, industrial patents, public websites, pieces of software, and so on. This tight interconnectedness of actors from both inside *and outside* the university makes it difficult to say where the ‘borders’ of the university, as a clearly demarcated, self-contained institution, would lie (Barnett, 2013). Equally, this atlas shows that most activities performed are of a rather generic kind: preparing oneself for some future event; conducting or attending seminars; judging and evaluating students, colleagues and larger conceptual matters (e.g. projects); designing; convening; communicating. Most of these activities are hardly exclusively associated with academic practices, and hence the question could be raised what, then, would constitute something typically academic (cf. Hamon & Rotman, 1981; Fanghanel, 2011)?

Instead of there being typical internal actors or activities, perhaps what is specific about academic practices is rather to be found in the way all these actors and activities *associate* with each other in a specific *mode*. With the term ‘mode’, we denote those forms of association that are typical for the studied practices or, to put this more generally, the very common texture of different academic practices (Fenwick & Landri, 2014; Latour, 2007, 2010). A mode, then, does not point to something like an ‘academic habitus’ –

which constitutes a rather person-oriented point of view on academic practice (Bourdieu, 1988) – but precisely to what the profiles and concomitant forms in this atlas share: Which constellations of actors are typical of academic practice? Which general distribution(s) do academic practices have in common? Which types of academics emerge, and finally, what about the digital in these academic practices?

First of all, the atlas illustrates that many activities share one or more *boundary actors*. We have characterized these boundary actors as being relays, possessing the capacity to effectively switch between different activities. As such, these actors came to stand more on their own: they are not regionally-specific, but deployed in more than one activity. This signifies the enormous importance of these boundary actors: they gather (actors in) different regions together, and could thus be conceived as a *thing* (Latour, 2004). That is to say, not as a mute object, but precisely as actors that *gather* different activities. There are no heroic, large-scale objects to be found here. Instead, the things in this atlas are pretty mundane: sheets, a web browser, a word processor, a student, etc. It is perhaps precisely in such mundane actors, however, that we can recognize a distinctive feature of the academic mode: it is a mode in which these actors come into being as *things*, in the sense that these actors are what the different activities share. In other words, it could be argued that it is only by focusing on actors and relations that we might eventually be able to get to grips with such associations (Latour et al., 2012): although a web browser, a word processor, paper, or a student are perhaps not often thought of as the most ‘decisive’ actors, they are precisely – as *things* – what holds different academic practices together. These things could then be considered to be prototypically academic: they *associate* academic practice, in the very sense that they bring this academic practice into union. Moreover, the third profile suggests that there are not only boundary actors, but also boundary zones: combinations of boundary actors that sound highly familiar (e.g. patent–browser–search engine; incoming email–attachment–article–phone; two PhD-students) and that bring academic practice into union. These associating zones could then equally be conceived as being prototypical academic things, making it possible, for instance, that performing one activity at the same time means performing another activity. In the atlas, a rather rigid separation was made between interfaces (pointing to permeable boundaries between regions) and infrastructure (pointing to the sort of actors populating a map). In a certain sense, however, with regard to boundary zones it could be stated that interface and infrastructure collide, namely, it is for the most part digital actors that are to be found in these boundary (interface) zones, together with the academics’ PhD-students. In other words, the distribution of actors in this third profile allowed an academic to switch from one activity to the other without having to physically displace herself, and this by grace of a mobilization of academic zones, that is, a combination of different boundary actors (mostly digital or PhD-students).

This distribution led, we argued, to practices in which time was rendered a *processing* character, in which one adapted constantly to the situation at hand, and space a *plastic* character, in which nearly any space could be rendered as a space fit for academic work. Eventually, it could be concluded that all this requires a highly employable academic who at once addresses many boundary actors in order for academic practice to be able to ‘function’ and who is in a permanent *standby position* herself in order to process whatever task ‘flows in’ (Guzmán & Barnett, 2013). In

contradistinction with the standby academic, the other two profiles showed academics who were operating as *task managers* in a timescape that was functionally differentiated – first this part of the to-do list, then this part, then that part – and eventually leading to a fragmented, ‘shredded’, whole. These shredded practices required an academic who was constantly on the move and going from one (equally functionally differentiated) space to the other, performing delineated activities that are either largely digital or largely analog. Additionally, in the second profile, we came to see an intensification of the functional differentiation in space, in the sense that the academic was urged to perform in a very specific manner, i.e. the academic was positioned in this academic practice as some sort of *circuit*, having to hold together many different (largely digital) components of, for instance, a webinar (which allowed for displacing oneself from one task to the other without having to move). At home, however, the academic in this second profile was not so much required to act as a circuit but rather as a *compromising* actor, and this in a rather hybrid timescape in which family-social activities coalesced with academic activities. This was due to a shared infrastructure: academic activities and private activities deployed the same (digital) actors. In sum, one might state that, whether academics are in a permanent standby position, compromising between family and professional activities, circuiting a particular practice or managing tasks, an academic mode seems characterizable as a mode in which academics are permanently busy (Ylijoki, 2013)

Finally, what about the digital in this academic mode? Hopefully, it has become clear by now that the digital is hardly analyzable as such: it flows in between other actors, exists only by grace of other analog, human and material elements, and is itself constituted by and composed of a great variety of actors. Perhaps this point in particular shows the significance of ‘the digital’: because digital actors are so entrenched in the conduct of academic activities, they are hardly analyzable on their own. It is probably here that the fruitfulness of adopting a relational sociomaterial stance is rendered most intelligible: instead of speaking about the digitization of the academic profession – as if digitization would constitute a separate factor influencing the academic profession and the university – this atlas displays the advantages of considering the digital relationally and framing it in the everyday (Beer, 2005; Weller, 2011). Similarly, it has become clear that digital actors are often acting as a *thing* and are highly present in the contemporary academic infrastructure, but equally that they often take up the form of a *center* or passage point (the email inbox and outbox, software packages, printers, word processors, etc.). Instead of being important in their own right, as is often argued, digital actors only take up central positions in academic practice because other actors relate to these actors. We have conceived of these centers as being in an authoritative position: it is in and through the conduct of academic practice that such digital actors are *being made* important. As such, the proliferation of these centers implies that the academic herself is to a certain extent being *decentralized* because of this presence of a variety of digital (but not only digital) actors. Indeed, the atlas suggests that the academic mode nowadays is characterized not only by delegating authority to other academics, PhD-students and other colleagues, but also and equally to digital actors. The presence of these digital centers, in turn, implies a further mobilization of many other actors, be they digital or human. In sum, it could be stated that the

presence of digital centers decentralizes the traditional human in academic practice, but that this very presence in turn gives way to the mobilization of other actors as well. As has been noted elsewhere, this suggests the importance of *digital fluencies* to be able to compose all of this (Beer, 2005; Thompson, 2012). That is to say, because ‘the digital’ takes up such a decisive role in contemporary academic practice, perhaps the academic mode is precisely characterized by finding ways to compose a digital fluency that is neither positioned exclusively in the person of the academic, nor exclusively in categories of activity domains such as research, teaching and service, which do not seem to fully capture what academic practice is (anymore). Rather, a continuous associating of all of these digital and other centers, boundary actors and infrastructures into what is often unreflexively called academic practice, seems to require a continuous searching, or the apt relational fluency, for how to compose the who, what, how and where of academic work in digital times.

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### Notes on Contributors

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